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Analysis of Vaginal Candidiasis Prevalence Among Bangladeshi Women in Relation to Menstrual Hygiene and Other Risk Factors: A Cross-Sectional Study

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Abstract

Vaginal candidiasis, which is an infection of the female reproductive system, continues to be a leading risk factor of morbidity, which negatively impact the physical and mental health of women worldwide. Despite widespread awareness, vaginal candidiasis is still seen as a minor health issue in many impoverished nations like Bangladesh. This study aimed to examine and evaluate the prevalence of vaginal candidiasis and its association with menstrual hygiene and other risk factors among reproductive-aged women by cross-sectional study. In this research study 37.30% of women (91 out of 244 patients) tested positive with vaginal candidiasis. From this study is was found that patients in their early and peak reproductive years are more susceptible to illness. The highest prevalence was seen among the participants who aged between 15-34 years (33%), which followed by 20.9% patients are between 35-44 years age group and 70.3% of patients were married. The most common symptoms patients faced in this study are irritation and swelling near genital area (24.8%), unusual vaginal discharge (22.6%), itching near genital area (20.4%), pain or burning sensation during urination (16.8%) and painful intercourse (11.7%). Besides, risk factors that caused the disease in patients to be found are, poor menstrual hygiene (35%), unsafe intercourse (38%), non-cotton and unclean undergarment (18.6%), use of over the counter antibiotic (14.2%), diabetes (8%), infected sexual partner (3.4%), STD (3%) and menopause (0.8%). Another major part of the study is to know about the relation between menstrual hygiene and vaginal candidiasis. About 33% of the women use cloth and another 33% use both sanitary napkin and cloth as an absorbent. It is also observed that 74.7% women change the absorbent only about 1-2 times per day. Though, Vaginal Candidiasis is a type of mild infection for most the cases still it needs to be given importance as it can cause troublesome and serious complications such as recurrent infection, candidemia etc.

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Introduction and Literature review

The female reproductive system is a sensitive and intricate part of the female body. Infections, injuries, and other issues (including some chronic ones) can be avoided if one takes the right precautions. Reproductive health is a subset of sexual and reproductive rights which focuses on an individual's overall well-being as it relates to reproduction at every age.

The World Health Organization (WHO) defines reproductive health as a “condition of full physical, mental, and social well-being in all aspects

relevant to the reproductive system and its activities and processes, which goes beyond the simple absence of sickness or infirmity". It is crucial to take good care of female reproductive organs in order to prevent a number of painful and uncomfortable reproductive illnesses and the spread of STDs. Keep one's reproductive system in good shape is guarantee to a healthy sexual life. Likewise, it's important for the growth of healthy kids. Women's reproductive health problems are directly responsible for the bulk of the world's 1.3 million female deaths per year.

Infections of the reproductive system are being recognized as a major worldwide health issue that affects not only individuals but also their loved ones and community. Negative effects such as infertility, ectopic pregnancy, persistent pelvic discomfort, miscarriage, and a higher risk of HIV transmission are all possible results. Since many female reproductive tract infections are asymptomatic or have vague symptoms, women bear a significant share of the burden of untreated RTIs. Despite the fact that RTIs afflict women in both developing and developed nations, the infections and their consequences are an especially pressing public health concern in places with limited access to healthcare. A 2003 CDC study found that the prevalence of reproductive tract disorders among women in underdeveloped nations was 10-15% greater than in developed ones. The proportion of female morbidity attributable to reproductive tract infections is 22 percent worldwide, with the highest frequency in South Asia and Sub-Saharan Africa (where 150 million of the total 340 million cases are concentrated) (Msuya et al., 2002).

Candidiasis is a type of fungal disease caused by yeast belonging to the genus*Candida*. Candidiasis is also known as thrush or moniliasis. *Candida* is a common yeast that lives harmlessly on the skin and in the body (in places including the mouth, throat, stomach, and genital tract). If environmental circumstances are favorable for *Candida* development, an infection may occur because of the overgrowth.

Types: Several types of candidiasis can be seen, they are:

- Mucosal Candidiasis: Conditions caused by *Candida* that affect the skin or mucous membranes. This type includes oral candidiasis, vaginal candidiasis, gastrointestinal and respiratory candidiasis.
- Cutaneous candidiasis: Fungal infection of the skin and nail is called cutaneous candidiasis.
- Systemic candidiasis: This type of candidiasis is also known as invasive candidiasis. Invasive candidiasis, is a life-threatening condition where *Candida* can spread to other organs and systems in the body through blood. Bloodstream infection caused by Candida, often known as candidemia.

Among all candidiasis oral candidiasis and vaginal candidiasis are most common. Five species of the genus*Candida* are responsible for around 90% of all infections; these are *Candida albicans*, *Candida glabrata*, *Candida tropicalis*, *Candida parapsilosis*, and *Candida krusei* (Turner & Butler, 2014).

As the name implies, vaginal candidiasis (VC) is an infection caused by yeast or fungi in the genital area (Okonkwo & Umeanaeto, 2011). The vagina and vulvar tissues become inflamed and itchy due to the vaginal yeast infection, which is caused by a *Candida* overgrowth. This disease is also known as vulvovaginal candidiasis or candidal vaginitis or vaginal thrush.

Vaginal Candidiasis develops when Candida organisms gradually invade the mucosal lining of the vagina and trigger an inflammatory reaction. Polymorphonuclear cells and macrophages are often the predominant inflammatory cells. Inflammatory alterations in the vaginal and vulvar epithelium are the direct result of a fungal infection, most often caused by *Candida albicans*, and are responsible for the development of vaginal candidiasis. *Candida* is considered part of a woman's natural flora, and many women have it without any noticeable symptoms (Patel et al, 2003). Thus, discomfort, itch, dysuria, or inflammation are necessary for a diagnosis of vaginal candidiasis in addition to the presence of *Candida* in the vagina/vulva.

Glycogen, a substrate on which *C. albicans* thrives, (Sustr et al., 2020) is produced in the vaginal lining because of oestrogen hormone. Symptoms tend to emerge in the second part of the menstruation, when progesterone levels are naturally higher. Female genital candidiasis, or vaginal candidiasis, is less prevalent in postmenopausal women of all ages because of the decline in estrogen levels.

A typical vaginal flora includes a mix of bacteria and yeast. Some strains of bacteria, termed*lactobacilli*, benefit from the presence of estrogen

and flourish as a result. These microorganisms protect health by eliminating pathogens in the vaginal environment. Yeast infections are caused by the fungus Candida, which can grow out of control if the body's natural defenses are overwhelmed. This disease often develops when the vaginal pH becomes unbalanced.

Vaginal candidiasis is extremely common, with 13 million cases reported each year in the United States alone (Horowitz, 1991). As many as 1.4 million women seek medical attention each year for vaginal candidiasis (Benedict et al., 2018). Vaginal infections caused by Candida are second only to bacterial vaginosis in frequency of occurrence (Diadhiou et al., 2019). Seventy-five percent of women, according to surveys, get thrush or yeast infection in their vagina at some point in their lives (Sobel, 2007). Forty to fifty percent of those women will have another episode (Sobel, 2014). Only around 8 percent of women get chronic candidal vulvovaginitis. The distinction between colonization and infection is crucial since half of infected women will have a second episode and 5–8% will have recurrent vulvovaginal candidosis (RVVC) if they are not treated. When Vulvovaginal Candidosis occurs more than four times in a year, it is considered recurrent. According to recent statistics, over 138 million women globally experience RVVC each year, and another 372 million experience it over the course of their lives (Denning et al., 2018). The peak incidence years for RVVC are between the ages of 19 and 35, and a recent study found that the prevalence of RVVC increases to 9 percent in those over the age of 50 (Blostein et al., 2017). As a result of a deficiency in the normally protective immune response to a prior Candida infection, women with RVVC are more susceptible to recurrent candidiasis (Fidel & Sobel, 1996).

Candida albicans accounts for over 90% of cases of vaginal candidiasis, whereas other species of*Candida* account for the remaining 10% (Abdullahi Nasir et al., 2015). For the rest, *C. glabrata* and *C. tropicalis* are the most frequent species (Felix et al., 2018). Women of all ages are susceptible to *Candida spp.* infections, although they are most common in those who are pregnant (nearly 24%) and in those who are not (around 17%) (Al-akeel et al., 2013). The most prevalent cause of VVC is *Candida albicans*, however widespread use of azole antifungal medicines may have led to a change in vaginal colonization and the selection of more naturally fungal species, such as *Candida glabrata* (Mathema et al., 2001).

Candida albicans was found to be the most common yeast isolate among these patients, accounting for 28 of the total cases (70%). It is also demonstrated that there is no statistically significant associations between vulvovaginal candidiasis and several demographic variables, including age, education, symptoms, contraception, marital status, and diabetes mellitus. However, no statistically significant association between vulvovaginal candidiasis and employment status was discovered (Reza Faraji et al., 2012).

A research study conducted in Nigeria found that female students in their early and prime reproductive years were more susceptible to infection, a peak incidence of vaginal candidiasis (32.3%) between the ages of 22 and 26, the ages of 17 and 21 had the next highest prevalence (29.4%), while the lowest (5.7%) prevalence among those aged 27 to 31years. From the study it was also observed that the highest occurrence which is 37.5% was linked to prolonged use of broad-spectrum antibiotics (Mbim E.et al., 2017). Another study, it is depicted that people with weakened immune systems were more likely to contract this infection. (Winston DJ, 1995).

The clinical signs and symptoms of vulvovaginal candidiasis include vulvovaginal pruritus, irritation, soreness, dyspareunia, burning on micturition, and whitish, cheesy discharge (Sobel et al, 1998).

This study demonstrated about the importance of screening for VC along with other vaginal infections as vaginal candidiasis (VC) is common among women who seek primary care for genital infections, and this study helped to identify its incidence and associated risk factors. No correlation was found between VC and *N. gonorrhoeae*, genital ulcers, age at first sexual activity, number of sexual partners, educational level, marital status, or antibiotic use. This makes it hard to predict VC based on sexual and social characteristics of women (Namkinga L.A. et al., 2005)

Aim of the Study

The fundamental purpose of this research is to get insight into,

- Risk Factors and Prevalence of Vaginal Candidiasis
- Relationships between Vaginal Candidiasis and Other Factors
- Another goal is to generalize the sample data into a representative picture of vaginal candidiasis in Bangladesh.

Research Methodology

A cross-sectional methodology was applied to analyze my data. Cross-sectional study is a type of descriptive study. For the purpose of a cross-sectional study, data is gathered from a large sample of participants at a particular time and location. Cross-sectional studies are passive in nature, collecting data without trying to change any of the observable factors.

Ethical Statement

Patients and/or their legal guardians gave their verbal agreement to participate in the study (in the case of minors). They were given thorough background on the research and its purpose. The responders' names were also concealed.

Area of Study and Participants

This cross-sectional study was performed on AK memorial hospital, Maona, Gazipur and Lubana General Hospital & Uttara Cardiac Center. Research took place between April 2019 and March 2020. The appropriate authorities were consulted and granted authorization before any data gathering began. I was provided access to patient records as well as authorization to speak with attending physicians and other hospital staff. Ultimately, permission to use the hospitals' pathology departments was obtained. This was done to aid in the process of closely monitoring the diagnostic procedures. There was a total of 244 patients enrolled in the research. In most cases, those who answered the survey were patients who visited the hospital for seeking treatment. Some of these patients required hospitalization in the gynecological units. Patients ranged in age from pre-puberty to well into menopause. The diversity of the study's participants in terms of socioeconomic status and level of education strengthens its overall coverage. Also, the geographical diversity of the research sites, with one hospital located in a metropolitan region and another in a rural community, further contributed to the study's all-encompassing nature.

To participate in the study the patient must be of reproductive age or older, Vaginal Candidiasis sufferers who came to these hospitals for treatment, vaginal candidiasis patients undergoing diagnostic testing.

Questionnaire

For collecting data, a questionnaire was prepared where participants age, marital status, socio-economic background, educational background, menstruation and menstrual hygiene related information, symptoms, complications and risk factors were included. Sexually transmitted disease data was not obtained because individuals were unwilling to disclose personal information. Participants who could read and write were given copies of the questionnaires to answer and return immediately, while those who could not were questioned orally and their replies documented.

Laboratory Tests

In both hospitals microscopic tests were done. Specimens were obtained by swabbing the vagina and were placed on a glass slide with a few drops of saline, then covered with a coverslip. Yeast cells were looked under microscope under 400x magnification. Vaginal swabs were mixed with another drop of saline solution and 10% KOH, which dissolves patient's cells and yeast can be seen easily in slides.

Statistical Analysis

For the data analysis Microsoft Excel and IBM SPSS is used. Descriptive statistics were used to assess the data gathered for this study.

Result

Data was summarized and analyzed after it was collected from patient interviews and pathology lab reports. The purpose of this data analysis is to determine the prevalence of various characteristics among patients and to compare these frequencies among patients with different factors.

Distribution of patients' with the disease

The total number of participants was 244. Among them 91 women were found positive for Vaginal Candidiasis. Hence, 91 women were selected as the study participants. Out of 91 patients 64 were married and 27 were unmarried. The result shows that prevalence of Vaginal Candidiasis is higher in married women (70.3%), rather than unmarried patients (29.7%). The highest number of VC patients, 31, i.e. 34.1% had completed their higher secondary education. Second highest number of VC patients have completed secondary education. Surprisingly about one-fourth percent of patients (25.3%) have completed Graduation. Also, the number of primary pass patients is 7 (7.7%), which is the second lowest value seen.

In this study, prevalence of vaginal candidiasis was observed among various socio-demographic factors such as age, marital status, education and social status.

Women of reproductive age were selected for the study. Age of the patients ranges from 15 to 64 years. Among all group Vaginal Candidiasis was mostly seen on 15-24 year's range group (33%) and 25-34 year's group (33%). Occurrence of Vaginal Candidiasis was observed least among the age group of 55-64 years (2.2%). 20.9% patients are from 35-44 age group and 11% are from 45-54 years range.

Among 91 participants, more than half participants have regular menstrual flow (51.6%). 2 participants were in their menopausal state. Rest of the women (46.2%) have irregular period.

It is also found that 40 patients have a menstrual cycle consisting of 3 to 5 days which is the highest among all groups (44%). The second highest number of participants are present on 1-3 days cycle, which is 27.5%. 26.4% patients have the most day containing cycle which is 5 to 7 days. 2 women don't have any cycle as they have menopause.

The vaginal candidiasis patient based on type of absorbent patient uses during menstruation is distributed as follows:

Table 1. Distribution of Type of Absorbent Patient Uses During Menstruation Among VC Patients

Type of Absorbent	Frequency	Percentage (%)
Cloth	30	33.0
Sanitary Napkin	29	31.9
Both	30	33.0
None	2	2.2
Total	91	100.0

It is observed from the above frequency table that, the most patient having Vaginal Candidiasis use cloth as their absorbent which is 33% (30 patients). Moreover, 29 patients (31.9%) use sanitary napkin and 30 patients (33%) use both cloth and sanitary napkin as their absorbent

during menstruation. 2 women do not use any absorbent as they are in their menopause state.

A total of 68 patients (74.7%) change their absorbent only 1-2 times in a day, which is the highest number of patients. Only 23.1% patient change their absorbent 3-4 times. 2 patients who were in menopause during the study were placed in the category of none.

The distribution of vaginal candidiasis patient based on their risk factors can be categorized in the following table:

Table 2. Frequency Table Distribution of Factors Causing the Disease Among VC Patients

Factors	Frequency	Percentage (%)
Use of over the Counter Antibiotic	36	39.6
Diabetes	11	12.1
Non-Cotton and Unclean Undergarment	21	23.1
Poor Menstrual Hygiene	21	23.1
Unsafe Intercourse	2	2.2
Total	91	100.0

The frequency table shows that the factor that caused the disease most is use of over the Counter Antibiotic (39.6%). The second highest risk factor is menstrual hygiene or Non-Cotton and Unclean Undergarment (23.1%).

The following table shows the age of Vaginal Candidiasis patients based on factors that caused the disease:

Table 3. Cross -table analysis of age of Vaginal Candidiasis patients based on factors that caused the disease

Age		Factors					Total
		Use of over the Counter Antibiotic	Diabetes	Non-Cotton and Unclean Undergarment	Poor Menstrual Hygiene	Unsafe Intercourse	
15-24	Count	10	2	10	8	0	30
	(%)	11.0%	2.2%	11.0%	8.8%	0.0%	33.0%
25-34	Count	11	4	8	6	1	30
	(%)	12.1%	4.4%	8.8%	6.6%	1.1%	33.0%
35-44	Count	9	2	2	5	1	19
	(%)	9.9%	2.2%	2.2%)	5.5%	1.1%	20.9%
45-54	Count	5	2	1	2	0	10
	(%)	5.5%	2.2%	1.1%	2.2%	0.0%	11.0%
55-64	Count	1	1	0	0	0	2
	(%)	1.1%	1.1%				2.2%
Total	(%)	39.6%	12.1%	23.1%	23.1%	2.2%	100.0%

Among the participants aged between 15-24, most the patients got this disease due to use of over the counter antibiotic (11%) and use of non-

cotton and unclean undergarments (11%), 8.8% had the disease due to poor menstrual hygiene and 2.2% had diabetes. Use of over the counter antibiotic is the main factor which caused the disease in most of the women, 12.1% in age range of 25-34, 9.9% in 35-44 age, 5.55% in 45-54 age and only 1.1% in participants age between 55-64. The next factor which caused the disease in most participants is poor menstrual hygiene and non-cotton and unclean undergarment. Where poor menstrual hygiene is seen on 6.6% (in 25-34), 5.5% (35-44), 2.2% (45-54) participants of different age group. Diabetes is the third causing factor, it caused disease in the women who aged between 25-34 (4.4%), total 4 person have diabetes age ranged between 35-54.

The following table shows the analysis of marital status of Vaginal Candidiasis patients based on factors:

Table 4. Cross-table analysis of marital status of Vaginal Candidiasis patients based on factors

Factors		Marital Status		Total
		Married	Unmarried	
Use of over the Counter Antibiotic	Count	28	8	36
	(%)	30.8%	8.8%	39.6%
Diabetes	Count	8	3	11
	(%)	8.8%	3.3%	12.1%
Non-Cotton and Unclean Undergarments	Count	11	10	21
	(%)	12.1%	11.0%	23.1%
Poor Menstrual Hygiene	Count	15	6	21
	(%)	16.5%	6.6%	23.1%
Unsafe Intercourse	Count	2	0	2
	(%)	2.2%		(2.2%)
Total	Count	64	27	91
	(%)	70.3%	29.7%	100.0%

The use of over the counter antibiotic is the reason which caused the disease in most married women (30.8%), poor menstrual hygiene affected 16.5% women, 12.1% used non-cotton and unclean undergarments, 2.2% had unsafe intercourse and 8.8% have diabetes. From the table it can be said that non-cotton and unclean undergarment mainly caused the disease in unmarried women (11%), 8.8% got it by using over the counter antibiotic, 3.3% have diabetes and 6.6% from poor menstrual hygiene.

The Distribution of Vaginal Candidiasis Patient Based on Their Symptoms (Multiple answer) is distributed as following:

Table 5. Frequency Table Distribution of Symptoms Displayed by the Patients Among VC Patients

Symptoms	Frequency	Percentage (%)
Pain or Burning Sensation during Urination	46	50.5
Nausea and Vomiting	1	1.1
Unusual Vaginal Discharge	31	34.1
Painful Menstruation	1	1.1
Painful Intercourse	3	3.3
Itching Near the Genital	8	8.8
Irritation, Sore or Swelling Near Genital Area	1	1.1
Total	91	100.0

A single patient can have more than one symptom present for Vaginal Candidiasis. Majority of the patient had unusual vaginal discharge (50.5%), whereas 34.1% of patients complained about having unusual vaginal discharge and 8.8% of patients having itching near the genital.

The cross - table analysis of age of Vaginal Candidiasis patients based on symptoms can be classified as following:

Table 6: Cross - table analysis of age of Vaginal Candidiasis patients based on symptoms

Symptoms		Age					
		15-24	25-34	35-44	45-54	55-64	Total
Pain or Burning Sensation during Urination	Count	10	15	12	8	1	46
	(%)	11.0%	16.5%	13.2%	8.8%	1.1%	50.5%
Nausea and Vomiting	Count	0	0	1(1.1%)	0	0	1(1.1%)
Unusual Vaginal Discharge	Count	14	10	4	2	1	31
	(%)	15.4%	11.0%	4.4%	2.2%	1.1%	34.1%
Painful Menstruation	Count	1(1.1%)	0	0	0	0	1(1.1%)
Painful Intercourse	Count	1	2	0	0	0	3
	(%)	1.1%	2.2%				(3.3%)
Itching Near the Genital	Count	4	2	2	0	0	8
	(%)	4.4%	2.2%	2.2%	0.0%	0.0%	8.8%
Irritation, Sore or Swelling Near Genital Area	Count	0	1(1.1%)	0	0	0	1(1.1%)
Total	(%)	33.0%	33.0%	20.9%	11.0%	2.2%	100.0%

From the cross-table analysis, it has been observed that, women aged between 15 to 24 years, 15.4% had unusual vaginal discharge, 11% had pain or burning sensation during urination, 4.4% had itching near the genital area, 1.1% had painful menstruation and 1.1% had painful intercourse as symptoms. Moreover, women aged between 25 to 34 years, 16.5% had pain or burning sensation during urination, 11% had unusual vaginal discharge, 2.2% had itching near the genital area, 2.2% had painful intercourse and 1.1% had irritation or swelling near the genital area as symptoms. Then, women aged between 35 to 44 years, 13.2% had pain or burning sensation during urination, 4.4% had unusual vaginal discharge, 2.2% had itching near the genital area, and 1.1% had nausea and vomiting as symptoms. Furthermore, women

aged between 45 to 54 years, 8.8% had pain or burning sensation during urination and 2.2% had unusual vaginal discharge as symptoms. Women aged between 55 to 64 years, 1.1% had unusual vaginal discharge, 1.1% had pain or burning sensation during urination as symptoms.

The cross-table analysis of the marital status of Vaginal Candidiasis patients based on symptoms:

Table 7. Cross-table analysis of marital status of Vaginal Candidiasis patients based on symptoms

Symptoms		Marital Status		Total
		Married	Unmarried	
Pain or Burning Sensation during Urination	Count	36	10	46
	(%)	39.6%	11.0%	50.5%
Nausea and Vomiting	Count	1(1.1%)	0	1(1.1%)
Unusual Vaginal Discharge	Count	19	12	31
	(%)	20.9%	13.2%	34.1%
Painful Menstruation	Count	0	1(1.1%)	1(1.1%)
Painful Intercourse	Count	3(3.3%)	0	3(3.3%)
Itching Near the Genital	Count	4	4	8
	(%)	4.4%	4.4%	8.8%
Irritation, Sore or Swelling Near Genital Area	Count	1(1.1%)	0	1(1.1%)
Total	(%)	70.3%	29.7%	100.0%

The cross-table analysis shows that the symptoms varied between married and unmarried patients, here 39.6% married women experienced pain or burning sensation during urination where as 11% unmarried women had this symptom. Similarly, unusual vaginal discharge was present on 20.9% married patients and 13.2% unmarried patients. Moreover, 4.4% from each married and unmarried woman faced itching near the genital area. Also, irritation, sore and swelling near the genital area was present in 1% married women and only married patients (3.3%) experienced painful intercourse and nausea and vomiting (1.1%) as a symptom. Besides, only unmarried patients (1.1%) experience painful menstruation as a symptom.

The following table shows the distribution of Vaginal Candidiasis Patient Based on Their Complications:

Table 8. Frequency Table Distribution of Complications Faced by the Patient Among VC Patients

Complications	Frequency	Percentage (%)
Recurrent of Infection	41	45.1
Candidemia	9	9.9
Skin Infection	30	33.0
None	11	12.1
Total	91	100.0

Surprisingly 45.1% patient had vaginal candidiasis for multiple times which is known as recurrent infection and the second most common

complication the patient faced was skin infection (33%).

The Cross - table analysis of age of Vaginal Candidiasis patients based on complications:

Table 9. Cross - table analysis of age of Vaginal Candidiasis patients based on complications

Age		Complications				
		Recurrent of Infection	Candidemia	Skin Infection	None	Total
15-24	Count	13 14.3%	3 3.3%	12 13.2%	2 2.2%	30 33%
25-34	Count (%)	18 19.8%	2 2.2%	6 6.6%	4 4.4%	30 33%
35-44	Count (%)	5 5.5%	3 3.3%	7 7.7%	4 4.4%	19 20.9%
45-54	Count (%)	4 4.4%	1 1.1%	4 4.4%	1 1.1%	10 11%
55-64	Count (%)	1 1.1%	0	1 1.1%	0	2 2.2%
Total	(%)	45.1%	9.9%	33.0%	12.1%	100%

From the cross-table analysis, it has been observed that, women aged between 15 to 24 years, 14.3% faced recurrent infection, 13.2% faced skin infection, 3.3% had candidemia and 2.2% did not face any complications. Moreover, women aged between 25 to 34 years, 19.8% faced recurrent infection, 6.6% faced skin infection, 2.2% had candidemia and 4.4% did not face any complications. Then, women aged between 35 to 44 years, 5.5% faced recurrent infection, 7.7% faced skin infection, 3.3% had candidemia and 4.4% did not face any complications. Furthermore, women aged between 45 to 54 years, 4.4% faced recurrent infection, 4.4% faced skin infection, 1.1% had candidemia and 1.1% did not face any complications. Women aged between 55 to 64 years, 1.1% faced recurrent infection, 1.1% faced skin infection as complications.

Cross-table analysis of marital status of Vaginal Candidiasis patients based on complications:

Table 10. Cross-table analysis of marital status of Vaginal Candidiasis patients based on complications

Complications		Marital Status		Total
		Married	Unmarried	
Recurrent of Infection	Count	29	12	41
	(%)	31.9%	13.2%	45.1%
Candidemia	Count	7	2	9
	(%)	7.7%	2.2%	9.9%
Skin Infection	Count	19	11	30
	(%)	20.9%	12.1%	33.0%
None	Count	9	2	11
	(%)	9.9%	2.2%	12.1%
Total	(%)	70.3%	29.7%	100.0%

This cross-table analysis shows that the variation of complications between married and unmarried women. Here, 31.9% of married women faced recurrent infection where 13.2% of unmarried women faced it. Moreover, 20.9% of married participants and 12.1% of unmarried participants got skin infection. 9.9% of married and 2.2% of unmarried women faced no complications where as 7.7% married participants and 2.2% unmarried participants got candidemia as a complication.

The association of Types of Absorbent with different factors is classified as following table.

Table 11. Cross-table analysis of Age and Types of Absorbent Used During Menstruation

Age (years)		Type of Absorbent				Total
		Cloth	Sanitary Napkin	Both	None	
15-24	Count	5	12	13	0	30
	(%)	5.5%	13.2%	14.3%	0.0%	33.0%
25-34	Count	6	14	10	0	30
	(%)	6.6%	15.4%	11.0%	0.0%	33.0%
35-44	Count	12	2	5	0	19
	(%)	13.2%	2.2%	5.5%	0.0%	20.9%
45-54	Count	7	1	2	0	10
	(%)	7.7%	1.1%	2.2%	0.0%	11.0%
55-64	Count	0	0	0	2(2.2%)	2(2.2%)
Total	(%)	33.0%	31.9%	33.0%	2.2%	100.0%

Among 15-24 age range 5.5% women use cloth 13.2% use sanitary napkin, 14.3% use both. Among 25-34 age range women, most of them use sanitary napkin as absorbent (15.4%), rest of them use cloth (6.6%) and both type of absorbent is used by 11%. 13.2% women aged between 35 to 44 years use cloth, 15.4% use sanitary napkin and 5.5% use both type of absorbent. Women aged between 45 to 54 years mostly use cloth (7.7%), the second highest percent of women use both type of absorbent (2.2%) and rest of 1.1% use sanitary napkin. Women of ages between 55 to 64 years do not use any type of absorbent as they have menopause.

Cross-table analysis of Marital Status of Vaginal Candidiasis patients based on type of absorbents:

Table 12. Cross-table analysis of Marital Status of Vaginal Candidiasis patients based on type of absorbents

Type of Absorbent		Marital Status		Total
		Married	Unmarried	
Cloth	Count	26	4	30
	(%)	28.6%	4.4%	33.0%
Sanitary Napkin	Count	16	13	29
	(%)	17.6%	14.3%	31.9%
Both	Count	20	10	30
	(%)	22.0%	11.0%	33.0%
None	Count	2(2.2%)	0	2(2.2%)
Total	Percentage (%)	70.3%	29.7%	100.0%

In married women about 28.6% use cloth, 17.6% use sanitary napkin, 22% use both type and 2.2% do not use any type of absorbent. In between unmarried women 4.4% use cloth, 14.3% use sanitary napkin, 11% use both type of absorbent. Married women mostly use cloth and unmarried women use sanitary napkin mostly.

Cross-table analysis of factors of Vaginal Candidiasis patients based on type of absorbents:

Table 13. Cross-table analysis of factors of Vaginal Candidiasis patients based on type of absorbents

Factors		Type of Absorbent				Total
		Cloth	Sanitary Napkin	Both	None	
Use of over the Counter Antibiotic	Count	16	5	14	1	36
	(%)	17.6%	5.5%	15.4%	1.1%	39.6%
Diabetes	Count	3	5	2	1	11
	(%)	3.3%	5.5%	2.2%	1.1%	12.1%
Non-Cotton and Unclean Undergarment	Count	3	10	8	0	21
	(%)	3.3%	11.0%	8.8%	0.0%	23.1%
Poor Menstrual Hygiene	Count	8	7	6	0	21
	(%)	8.8%	7.7%	6.6%	0.0%	23.1%
Unsafe Intercourse	Count	0	2(2.2%)	0	0	2(2.2%)
Total	(%)	33.0%	31.9%	33.0%	2.2%	100.0%

From the cross table it has been observed that women who use cloth as absorbent, 17.6% had over the counter antibiotic, 3.3% have diabetes, 3.3% use non-cotton and unclean undergarment and 8.8% women use non-cotton and unclean undergarment. Among the patients who use sanitary napkin, using of non-cotton and unclean undergarment caused the disease in most (11%) also poor menstrual hygiene is the second highest factor which caused the disease (7.7%). Using over counter antibiotic caused the disease in most women who use both type of absorbent (15.4%). Cross-table analysis of symptoms of Vaginal Candidiasis patients based on type of absorbents:

Table 14: Cross-table analysis of symptoms of Vaginal Candidiasis patients based on type of absorbents

Symptoms		Type of Absorbent				Total
		Cloth	Sanitary Napkin	Both	None	
Pain or Burning Sensation during Urination	Count	22	11	12	1	46
	(%)	24.2%	12.1%	13.2%	1.1%	50.5%
Nausea and Vomiting	Count	1	0	0	0	1
		1.1%	0.0%	0.0%	0.0%	1.1%
Unusual Vaginal Discharge	Count	5	12	13	1	31
	(%)	5.5%	13.2%	14.3%	1.1%	34.1%
Painful Menstruation	Count	0	1(1.1%)	0	0	1(1.1%)
Painful Intercourse	Count	1	2	0	0	3
	(%)	1.1%	2.2%	0.0%	0.0%	3.3%
Itching Near the Genital	Count	1	3	4	0	8
	(%)	1.1%	3.3%	4.4%	0.0%	8.8%
Irritation, Sore or Swelling Near Genital Area	Count	0	0	1(1.1%)	0	1(1.1%)
Total	(%)	33.0%	31.9%	33.0%	2.2%	100.0%

Among women who use cloth as absorbent, 24.2% had pain or burning sensation during urination, 5.5% had unusual vaginal discharge, 1.1% faced nausea and vomiting, 1.1% faced painful intercourse and itching near the genital area is seen in 1.1%. Moreover, patients who use sanitary napkin, among them 13.2% showed unusual vaginal discharge, 12.1% had pain and burning sensation during urination, 3.3% faced itching near genital area, 2.2% had painful intercourse and 1.1% had painful menstruation which showed as symptom. Additionally, patients who employ both absorbent types, 14.3% had unusual vaginal discharge, 13.2% had pain and burning sensation while urinating, 4.4% faced itching and 1.1% faced irritation or swelling near genital area. Furthermore, participants those do not use any type of absorbents, among them, 1.1% faced pain or burning sensation during urination and 1.1% had unusual vaginal discharge.

Cross-table analysis of complications of Vaginal Candidiasis patients based on type of absorbents:

Table 15. Cross-table analysis of complications of Vaginal Candidiasis patients based on type of absorbents

Complications		Type of Absorbent				Total
		Cloth	Sanitary Napkin	Both	None	
Recurrent of Infection	Count	12	14	14	1	41
	(%)	13.2%	15.4%	15.4%	1.1%	45.1%
Candidemia	Count	4	4	1	0	9
	(%)	4.4%	4.4%	1.1%	0.0%	9.9%
Skin Infection	Count	13	5	11	1	30
	(%)	14.3%	5.5%	12.1%	1.1%	33.0%
None	Count	1	6	4	0	11
	(%)	1.1%	6.6%	4.4%	0.0%	12.1%
Total	(%)	33.0%	31.9%	33.0%	2.2%	100%

From the cross-table analysis, it is observed that women who use cloth as absorbent, among them 14.3% faced skin infection, 13.2% had recurrent infection, 4.4% had candidemia and only 1.1% faced no complications at all. Moreover, patients who use sanitary napkin, 15.4% faced recurrent infection, 12.1% had skin infection, 4.4% had candidemia and 6.6% faced no complications at all. Additionally, patients who

employ both absorbent types, 15.4% patients faced recurrent infection, 12.1% had skin infection, 1.1% faced candidemia and 4.4% patients had no complications. Furthermore, participants those do not use any type of absorbents, among them, 1.1% faced recurrent infection and 1.1% had skin infection.

The association of Absorbent Change Rate per Day with different factors is shown in following table:

Table 16. Cross - table analysis of age of Vaginal Candidiasis patients based on absorbent change rate per day

Age		Absorbent Change Rate in a Day			Total
		1-2 times	3-4 times	None	
15-24	Count	28	2	0	30
	(%)	30.8%	2.2%	0.0%	33.0%
25-34	Count	17	13	0	30
	(%)	18.7%	14.3%	0.0%	33.0%
35-44	Count	13	6	0	19
	(%)	14.3%	6.6%	0.0%	20.9%
45-54	Count	10(11.0%)	0	0	10(11.0%)
55-64	Count	0	0	2(2.2%)	2(2.2%)
Total	(%)	74.7%	23.1%	2.2%	100.0%

From the cross-table analysis of age of VC patients based on absorbent change rate, it can be seen from participants aged between 15 to 24, most of them change the absorbent rate 1-2 times per day (30.8%), rest of the participants (2.2%) change absorbent 3-4 times in a day. In all of the age range most of the participants change their absorbent only 1-2 times, result in 18.7% in 25-34, 14.3% in 35-44 and 11% on women age ranged between 45-54. Among participants who change absorbent 3-4 times a day, 14.3% are from 25-34 age and 6.6% are from 35-44 age range. Women aged among 55 to 64 years age do not need to change absorbent as they have menopause.

Cross-table analysis of marital status of Vaginal Candidiasis patients based on absorbent change rate

Table 17. Cross-table analysis of marital status of Vaginal Candidiasis patients based on absorbent change rate

Absorbent Change Rate in a Day		Marital Status		Total
		Married	Unmarried	
1-2 times	Count	42	26	68
	(%)	46.2%	28.6%	74.7%
3-4 times	Count	20	1	21
	(%)	22.0%	1.1%	23.1%
None	Count	2(2.2%)	0	2(2.2%)
Total	(%)	70.3%	29.7%	100.0%

Among married women 46.2% change the absorbent 1-2 times per day, where as 22% change it around 3-4 times per day. Only 1.1% of unmarried women change the absorbent using while in menstruation 3-4 times where as 28.6% change it 1-2 times.

Cross-table analysis of factors of Vaginal Candidiasis patients based on absorbent change rate in a day:

Table 18. Cross-table analysis of factors of Vaginal Candidiasis patients based on absorbent change rate in a day

Factors		Absorbent Change Rate in a Day			Total
		1-2 times	3-4 times	None	
Use of over the Counter Antibiotic	Count	27	8	1	36
	(%)	29.7%	8.8%	1.1%	39.6%
Diabetes	Count	6	4	1	11
	(%)	6.6%	4.4%	1.1%	12.1%
Non-Cotton and Unclean Undergarment	Count	19	2	0	21
	(%)	20.9%	2.2%	0.0%	23.1%
Poor Menstrual Hygiene	Count	15	6	0	21
	(%)	16.5%	6.6%	0.0%	23.1%
Unsafe Intercourse	Count	1	1	0	2
	(%)	1.1%	1.1%	0.0%	2.2%
Total	(%)	74.7%	23.1%	2.2%	100.0%

From the cross-table analysis of symptoms of VC patients based on absorbent change rate, it can be seen that, patients who change absorbent 1-2 times a day, 29.7% used over the counter antibiotic, 20.9% use non-cotton and unclean undergarment, 16.5% had poor menstrual hygiene, 1.1% had unsafe intercourse and 6.6% have diabetes which caused the disease. Additionally, VC patients who change absorbent 3-4 times per day, among them 8.8% used over the counter antibiotic, 2.2% use non-cotton and unclean undergarment, 6.6% had poor menstrual hygiene, 1.1% had unsafe intercourse and 4.4% have diabetes as causative factor. Moreover, participants who do not change absorbent, 1.1% used over the counter antibiotic, 1.1% have diabetes which caused the disease. Cross-table analysis of symptoms of Vaginal Candidiasis patients based on absorbent change rate:

Table 19. Cross-table analysis of symptoms of Vaginal Candidiasis patients based on absorbent change rate

Symptoms		Absorbent Change Rate in a Day			Total
		1-2 times	3-4 times	None	
Pain or Burning Sensation during Urination	Count	35	10	1	46
	(%)	38.5%	11.0%	1.1%	50.5%
Nausea and Vomiting	Count	1(1.1%)	0	0	1(1.1%)
Unusual Vaginal Discharge	Count	22	8	1	31
	(%)	24.2%	8.8%	1.1%	34.1%
Painful Menstruation	Count	0	1(1.1%)	0	1(1.1%)
Painful Intercourse	Count	2	1	0	3
	(%)	2.2%	1.1%	0.0%	3.3%
Itching Near the Genital	Count	8(8.8%)	0	0	8(8.8%)
Irritation, Sore or Swelling Near Genital Area	Count	0	1(1.1%)	0	1(1.1%)
Total	(%)	74.7%	23.1%	2.2%	100.0%

From the cross-table analysis of symptoms of VC patients based on absorbent change rate, it can be seen that, patients who change absorbent 1-2 times a day, 38.5% had pain or burning sensation while urinating, 24.2% showed unusual vaginal discharge, 8.8% had itching near genital area, 2.2% had painful intercourse and 1.1% faced nausea and vomiting. Additionally, VC patients who change absorbent 3-4 times per day, among them 11% had pain or burning sensation while urinating, 8.8% showed unusual vaginal discharge, 1.1% had painful

intercourse, 1.1% had painful menstruation and 1.1% faced irritation and swelling near genital area as symptom. Moreover, participants who do not change absorbent, 1.1% had pain or burning sensation while urinating, 1.1% showed unusual vaginal discharge as symptoms.Cross-table analysis of complications of Vaginal Candidiasis patients based on absorbent change rate:

Table 20. Cross-table analysis of complications of Vaginal Candidiasis patients based on absorbent change rate

Complications		Absorbent Change Rate in a Day			Total
		1-2 times	3-4 times	None	
Recurrent of Infection	Count	32	8	1	41
	(%)	35.2%	8.8%	1.1%	45.1%
Candidemia	Count	7	2	0	9
	(%)	7.7%	2.2%	0.0%	9.9%
Skin Infection	Count	21	8	1	30
	(%)	23.1%	8.8%	1.1%	33.0%
None	Count	8	3	0	11
	(%)	8.8%	3.3%	0.0%	12.1%
Total	(%)	74.7%	23.1%	2.2%	100.0%

From the cross-table analysis of complications of VC patients based on absorbent change rate, it can be seen that, patients who change absorbent 1-2 times a day faced recurrent infection most (35.2%), from rest 23.1% had skin infection, 7.7% had candidemia and 8.8% faced no complication at all. Additionally, VC patients who change absorbent 3-4 times per day, among them, 8.8% faced recurrent infection and another 8.85 had skin infection, 2.2% had candidemia and 3.3% had no complication. Moreover, participants who do not change absorbent, 1.1% faced skin infection and 1.1% faced recurrent infection.

Conclusion

Sexual and Reproductive Health and Rights (SRHR) for women still remains as a taboo in our country. This study was conducted over the course of almost a year with the purpose of evaluating the incidence and various risk factors of Vaginal Candidiasis among Bangladeshi women.

This research shows that 37.30% of women (91 out of 244 patients) tested had vaginal candidiasis whereas Brande et al. (1996) assessment shows yeast infections affect around 75% women at some point in their lives. The highest prevalence was among the patients who aged between 15-34 years (33%) followed by 20.9% patients were between 35-44 age group, 11% are from 45-54 years range; and 2.2% within the age range of 55-64 years. Vaginal candidiasis is more prevalent among reproductive-age women than among those of any other age (Müller, J., 1993) and (Emeribe, A. U. et al, 2015).

From the result it was found that prevalence of Vaginal Candidiasis is higher in married women (70.3%), rather than unmarried patients (29.7%). According to a study conducted by Dou et al. (2015), the researchers found out that married women were more likely to experience Vaginal Candidiasis between the ages of 15 and 34 years old had the highest rates of vaginal candidiasis, and 70.3% of all patients were married.

Menstrual hygiene is one the most important factor that can cause vaginal candidiasis among women. This study showed that among cloth, sanitary napkin and mixture of both, most patients use cloth and both cloth and sanitary napkin as an absorbent. 33% use cloth and 33% use both types. Also, from this study it was found that, 74.7% women change absorbents 1-2 times a day and only 23.1% change it 3-4 times per day. From these results it can be said that most of the patients have poor menstrual hygiene. Women who used reusable sanitary napkins had

a higher risk of contracting Candida than those who used disposable ones, according to research by Torondel et al. (2018).

The most common symptoms patients faced in this study are irritation and swelling near genital area (24.8%), unusual vaginal discharge (22.6%), itching near genital area (20.4%), pain or burning sensation during urination (16.8%) and painful intercourse (11.7%). Patients with positive cultures may experience symptoms such as vaginal itching either with or without vaginal discharge (50%), vaginal discharge alone (30%), or no symptoms at all (20%) found by (Oriel et al., 1972).

Pregnancy, hormone replacement, poorly managed diabetic mellitus, immunosuppression, the use of antibiotics and glucocorticoids, and genetic predispositions are all hypothesized to increase the risk of infection in the host (Sobel, 2007). From this study risk factors that caused the disease in patients to be found are, poor menstrual hygiene (35%), unsafe intercourse (38%), non-cotton and unclean undergarment (18.6%), use of over the counter antibiotic (14.2%), diabetes (8%), infected sexual partner (3.4%), STD (3%) and menopause (0.8%). The increased prevalence of vulvovaginal candidiasis (VVC) in diabetic women compared to nondiabetic women has led researchers to speculate that diabetes mellitus (DM) may be a risk factor for the development of vulvovaginal candidiasis VVC (Gonçalves et al., 2015). For women with diabetes, the prevalence of VVC is estimated to be 32.5–67.5%, while for those without diabetes it is 11–23% (Goswami et al., 2006). Inadequate hygiene, for instance, can serve as a reservoir for Candida spores in the digestive tract, leading to an elevated spore burden (Ferrer, 2000). As reported by Ahmad and Khan (2009) in India, the prevalence of VVC was 36 percent greater among women who reported having poor genital cleanliness compared to those who reported having good personal hygiene. According to a Brazilian research, the prevalence of VVC is 65.8 percent greater in women who wear tight and/or synthetic underwear compared to those who don't (39.1 percent) (Holanda et al., 2007). Antibiotic-treated women had a higher risk of developing VVC than antibiotic-naive women, supported by the studies in India (Ahmad & Khan, 2009), Greece (Grigoriou et al., 2006), and Italy (Spinillo et al., 1995, 1999). The main complication participants faced in this study is recurrent infection. Only around 5% of women may get four or more vaginal yeast infections in a single year, a medical term known as Recurrent Vaginal Candidiasis (RVC).

To overcome the problems with Vaginal Candidiasis, education about reproductive health, reproductive health diseases and infections, and menstrual hygiene needs to be taught in schools so that from a young age, female can learn and know how to have a healthy life style. Also, proper training for screening methods and distinguishing between different RTI can be arranged in hospitals. Government should lower the price of menstrual products and provide WASH facilities for women. Professionals in the medical field should highlight the need of regular examinations and practicing good reproductive hygiene in preventing these diseases. Preventing drug-resistant Candida strains, reducing the incidence of RVVC, and taking into account potential medication interactions will all be more pressing concerns in the years to come. One of the most difficult tasks will be to stop fungal infections from developing resistance to antibiotic drugs.

Statements and Declarations

Patients and/or their legal guardians gave their verbal agreement to participate in the study (in the case of minors). They were given thorough background on the research and its purpose. The responders' names were also concealed.

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